Common Market for Eastern and Southern Africa

EDICT OF GOVERNMENT

COMESA 207 (2006) (English): Wood — Determination of volumetric swelling

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COMESA HARMONISED STANDARD

COMESA/FDHS 207:2006

Wood — Determination of volumetric swelling

REFERENCE: FDHS 207: 2006

Foreword

The Common Market for Eastern and Southern Africa (COMESA) was established in 1994 as a regional economic grouping consisting of 20 member states after signing the co-operation Treaty. In Chapter 15 of the COMESA Treaty, Member States agreed to co-operate on matters of standardisation and Quality assurance with the aim of facilitating the faster movement of goods and services within the region so as to enhance expansion of intra-COMESA trade and industrial expansion.

Co-operation in standardisation is expected to result into having uniformly harmonised standards. Harmonisation of standards within the region is expected to reduce Technical Barriers to Trade that are normally encountered when goods and services are exchanged between COMESA Member States due to differences in technical requirements. Harmonized COMESA Standards are also expected to result into benefits such as greater industrial productivity and competitiveness, increased agricultural production and food security, a more rational exploitation of natural resources among others.

COMESA Standards are developed by the COMESA experts on standards representing the National Standards Bodies and other stakeholders within the region in accordance with international procedures and practices. Standards are approved by circulating Final Draft Harmonized Standards (FDHS) to all member states for a one Month vote. The assumption is that all contentious issues would have been resolved during the previous stages or that an international or regional standard being adopted has been subjected through a development process consistent with accepted international practice.

COMESA Standards are subject to review, to keep pace with technological advances. Users of the COMESA Harmonized Standards are therefore expected to ensure that they always have the latest version of the standards they are implementing.

This COMESA standard is technically identical to ISO 4860:1982, *Wood — Determination of volumetric swelling*.

International Standard 4860

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION•МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ•ORGANISATION INTERNATIONALE DE NORMALISATION

Wood — Determination of volumetric swelling

Bois — Détermination du gonflement volumique

First edition — 1982-12-01

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards institutes (ISO member bodies). The work of developing International Standards is carried out through ISO technical committees. Every member body interested in a subject for which a technical committee has been set up has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work.

Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council.

International Standard ISO 4860 was developed by Technical Committee ISO/TC 55, *Sawn timber and sawlogs*, and was circulated to the member bodies in April 1980.

It has been approved by the member bodies of the following countries:

Australia	Ghana	Poland
Austria	Hungary	Romania
Belgium	India	South Africa, Rep. of
Brazil	Italy	Spain
Bulgaria	Korea, Dem. p. Rep. of	Sweden
Czechoslovakia	Korea, rep. of	Turkey
Egypt, Arab Rep. of	New Zealand	USSR
Finland	Norway	Yugoslavia

The member bodies of the following countries expressed disapproval of the document on technical grounds:

Canada
France
Ireland
Netherlands

Printed in Switzerland

Wood — Determination of volumetric swelling

1 Scope and field of application

This International Standard specifies two methods for the determination of the volumetric swelling of wood:

— the stereometric method, used for test pieces made in accordance with ISO 4859;

— the mercury volumenometer method, used for test pieces of any shape.

2 References

ISO 3129, *Wood — Sampling methods and general requirements for physical and chemical test.*

ISO 3130, *Wood — Determination of moisture content for physical and mechanical tests.*

ISO 4859, *Wood — Determination of radial and tangential swelling.*

3 Principle

Determination of the change in volume of test pieces after drying, at a moisture content in equilibrium with the normal environment, and at a moisture content equal to or greater than the saturation point of the cellular walls of wood.

4 Stereometric method

4.1 Apparatus

See ISO 4859, clause 4.

4.2 Preparation of test pieces

See ISO 4859, clause 5.

4.3 Procedure [1]

4.3.1 Carry out the test in accordance with ISO 4859, clause 6.

4.3.2 For species showing significant swelling along the grain, also measure the dimensional changes of the test piece in the longitudinal direction.

4.4 Expression of results

4.4.1 Calculate the total volumetric swelling, $\alpha_{V\max}$, as a percentage, without taking account the swelling along the grain, by the (approximate) formula

$$\alpha_{V\max} = \frac{(l_{t\,max} \times l_{r\,max}) - (l_{t\,min} \times l_{r\,min})}{l_{t\,min} \times l_{r\,min}} \times 100$$

where

$l_{t\,max}$ and $l_{r\,max}$ are the dimensions of the test piece, in millimetres, at a moisture content greater than the saturation point of the cellular walls of wood, measured in the tangential and radial directions, respectively;

$l_{t\,min}$ and $l_{r\,min}$ are the dimensions of the test piece, in millimetres, after drying, measured in the tangential and radial directions, respectively.

Express the result to the nearest 0,1 %.

Calculate the total volumetric swelling, $\alpha_{V\max}$, if dimensional changes have been also measured on the test piece in the longitudinal direction, as a percentage, by the formula

$$\alpha_{V\max} = \frac{(l_{t\,max} \times l_{r\,max} \times l_{a\,max}) - (l_{t\,min} \times l_{r\,min} \times l_{a\,min})}{l_{t\,min} \times l_{r\,min} \times l_{a\,min}} \times 100$$

where

$l_{t\,max}$, $l_{r\,max}$, and $l_{a\,max}$ are the dimensions of the test piece, in millimetres, at a moisture content greater than the saturation point of the cellular walls of wood, measured in the tangential, radial and longitudinal directions, respectively.

$l_{t\,min}$, $l_{r\,min}$ and $l_{a\,min}$ are the dimensions of the test piece, in millimetres, after drying, measured in the tangential, radial and longitudinal directions, respectively.

Express the result to the nearest 0,1 %.

1) If necessary, swelling may also be determined at relative humidities between 30 and 90 %.

4.4.2 Calculate the volumetric swelling, α_{Vn}, when the moisture content changes to equilibrium with the normal environment (relative humidity 65 ± 5 %; temperature 20 ± 2 °C), as a percentage, by the formula

$$\alpha_{Vn} = \frac{(l_t \times l_r) - (l_{t\,min} \times l_{r\,min})}{l_{t\,min} \times l_{r\,min}} \times 100$$

where

l_t and l_r are the dimensions of the test piece, in millimetres, at a moisture content in equilibrium with the normal environment, measured in the tangential and radial directions, respectively;

$l_{t\,min}$ and $l_{r\,min}$ have the same meaning as in 4.4.1.

Express the result to the nearest 0,1 %.

Calculate the total volumetric swelling, α_{Vn}, if dimensional changes have been also measured on the test piece in the longitudinal direction, as a percentage, by the formula

$$\alpha_{Vn} = \frac{(l_t \times l_r \times l_a) - (l_{t\,min} \times l_{r\,min} \times l_{a\,min})}{l_{t\,min} \times l_{r\,min} \times l_{a\,min}} \times 100$$

where

l_t, l_r and l_a are the dimensions of the test piece, in millimetres, at a moisture content in equilibrium with the normal environment, measured in the tangential, radial and longitudinal direction, respectively;

$l_{t\,min}$, $l_{r\,min}$ and $l_{a\,min}$ have the same meaning as in 4.4.1.

Express the result of the nearest 0,1 %.

5 Mercury volumenometer method

5.1 Apparatus

5.1.1 Mercury volumenometer, capable of measuring the volume of a test piece, from the volume of mercury it displaces, to an accuracy of 0,01 cm³.

NOTE — It is necessary to observe appropriate safety precautions when using a mercury volumenometer.

5.1.2 Oven, for drying wood at a temperature of 103 ± 2 °C.

5.1.3 Vessel, containing distilled water.

5.1.4 Air-tight vessel, containing a desiccant.

5.2 Preparation of test pieces

5.2.1 Test pieces may be made in any shape, but shall have a volume of 4 to 16 cm³.

5.2.2 The number of test pieces shall be in accordance with ISO 3129.

5.3 Procedure[1)]

5.3.1 Dry the test pieces to constant volume at a temperature of 103 ± 2 °C in the oven (5.1.2) so that no checks distorting their dimensions and shape occur. Check the changes in volume of two or three control test pieces by repeated measurements, as specified in 5.3.4, every 2 h after 6 h from the beginning of drying. Stop the drying when the difference between two successive measurements does not exceed 0,02 cm³. The drying of test pieces may be stopped by using the method of successive weighing in accordance with ISO 3130.

5.3.2 Test pieces in which checks occurred during the test period shall be disregarded.

5.3.3 Cool the test pieces to room temperature in the air-tight vessel containing the desiccant (5.1.4).

5.3.4 Measure the volume, V_{min}, of every test piece to an accuracy of 0,01 cm³.

5.3.5 Condition the test pieces to a moisture content in equilibrium with the normal environment (relative humidity 65 ± 5 %; temperature 20 ± 2 °C) so that no checks distorting their dimensions and shape occur. Check the changes in volume of two or three control test pieces by repeated measurements, as specified in 5.3.4, every 6 h after stabilization of the conditioning environment. Stop the conditioning when the difference between two successive measurements does not exceed 0,02 cm³. The conditioning of test pieces may be stopped by using the method of successive weighing in accordance with ISO 3130.

5.3.6 Measure the volume, V, of every test piece, as specified in 5.3.4.

5.3.7 Submerge the test pieces in distilled water in the vessel (5.1.3) and soak at a temperature of 20 ± 5 °C until no further change in volume occurs. Check the changes in volume every 3 days by repeated measurement of two or three control test pieces. Stop the soaking when the difference between two successive measurements does not exceed 0,02 cm³.

5.3.8 Measure the volume, V_{max} of every test piece, as specified in 5.3.4.

1) If necessary, swelling may also be determined at relative humidities between 30 and 90 %.

5.4 Expression of results

5.4.1 Calculate the total volumetric swelling, $\alpha_{V\max}$, as a percentage, by the formula

$$\alpha_{V\max} = \frac{V_{\max} - V_{\min}}{V_{\min}} \times 100$$

where $V_{\max}$ and $V_{\min}$ are the volumes of the test piece, in cubic centimetres, after drying and at a moisture content greater than the saturation point of the cellular walls of wood, respectively.

Express the result to the nearest 0,1 %.

5.4.2 Calculate the volumetric swelling, α_{Vn}, when the moisture content changes to equilibrium with the normal environment, as a percentage, by the formula

$$\alpha_{Vn} = \frac{V - V_{\min}}{V_{\min}} \times 100$$

where

V is the volume of the test piece, in cubic centimetres, at a moisture content in equilibrium with the normal environment;

$V_{\min}$ has the same meaning as in 5.4.1

Express the result to the nearest 0,1 %.

6 Test report

The test report shall include the following particulars:

a) reference to this International Standard;

b) information required by ISO 3129 (subclause 6.4);

c) method of determining swelling;

d) type and volume of material tested (stand and number of selected trees; lot of sawn timber and number of selected boards, etc);

e) shape and dimensions of the test pieces; the directions of the grains;

f) number of test pieces tested;

g) moisture content in equilibrium with the normal environment (relative humidity 65 ± 5 %; temperature 20 ± 2 °C);

h) the test results, calculated as specified in 4.4 and 5.4, and their statistical values (together with the relative humidity and temperature if swelling was determined under conditions different from those specified in 4.3 or 5.3.5).;

j) date of testing;

k) place of testing.

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